# Nora Loose

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## Research Interests

Physical & computational oceanography, North Atlantic-Arctic connectivity, Ice-ocean interactions, Ocean observing system design, Inverse and adjoint modeling, Uncertainty quantification

## Education

**08/2019** **University of Bergen**, Bergen, Norway.
**Ph.D.** in **Physical Oceanography**
○ Thesis: *Adjoint Modeling and Observing System Design in the Subpolar North Atlantic*
○ Advisors: Kerim H. Nisancioglu (University of Bergen), Patrick Heimbach (UT Austin)
○ Funded by European Research Council project ice2ice

**02/2013** **University of Bonn**, Bonn, Germany.
**Diploma** (equiv. M.Sc. degree) in **Mathematics**, **with Honors**
○ Specialization: Stochastic Analysis; Minor: Physics

## Professional Appointments

**10/2018 -** **Research Fellow**, *Oden Institute for Computational Engineering and Sciences*, University
**present** of Texas at Austin, USA.
○ Mentor: Patrick Heimbach
○ Investigate dynamical teleconnections in the North Atlantic and Arctic Ocean
○ Develop quantitative and dynamics-based methods for ocean observing system design

**03/2013 -** **Research Fellow**, *Department of Mathematics*, ETH Zurich, Switzerland.
**08/2014** ○ Conducted research in the fields of Geometric Analysis and Partial Differential Equations
○ Taught courses for graduate and undergraduate students

## Teaching and Outreach

**February** **Volunteer**, *Girl Day STEM Festival*, UT Austin.
**2020** ○ hands-on science activities and demonstrations for elementary and middle school students

**03/2013 -** **Teaching Assistant**, *Department of Mathematics*, ETH Zurich, Switzerland.
**08/2014** ○ Taught 3 math courses (*Measure Theory and Integrals, Differential Geometry I & II*) for graduate and undergraduate students
○ *Teaching evaluations*: 4.8 (2013), 4.9 (2014) on a scale from 1 (very bad) to 5 (excellent)

**07/2013** **Teaching Assistant**, *PCMI Graduate Summer School*, Park City, USA.
○ Taught advanced math course (*Weak immersions of surfaces with $L^2$-bounded second fundamental form*) for Ph.D. students and postdocs

**10/2008 -** **Teaching Assistant**, *Department of Mathematics*, University of Bonn, Germany.
**02/2013** ○ Taught 3 math courses (*Mathematics for Physicists I, Analysis II & III*) for undergraduate students

**01/2010 -** **Teaching Assistant**, *Department of Mathematics*, University of Toronto, Canada.
**04/2010** ○ Taught math course (*Linear Algebra*) for undergraduate students

**2009 - 2011** **Organizer of outreach events**, *Hausdorff Center for Mathematics*, University of Bonn, Germany.
○ Organized and led math outreach events for students from elementary and secondary school
○ Ran bi-weekly club to foster students' talent for mathematics

## Professional Service

### Organization of Conferences

04/2017  Co-Convener for the session "Quaternary climate archives and proxy uncertainty", EGU General Assembly 2017.

09/2015  Co-Organizer of PhD conference "Connecting the ocean, atmosphere and ice sheets", 20 participants, Denmark.

## Awards and Scholarships

04/2019  **Rising Stars in Computational & Data Sciences**, *Oden Institute for Computational Engineering and Sciences*, University of Texas at Austin, USA.
  - Selected to attend the competitive and international career event "Rising Stars in Computational & Data Sciences" for women (acceptance rate: 21%)

03/2018  **Best Presentation Award**, *Research School on Changing Climates in the Coupled Earth System*, Sommarøy, Norway.

02/2016  **Research Grant**, *Norwegian Research School in Climate Dynamics*, NOK 20,000, for research stay at MIT.

2013 - 2016  **Scholarships for various summer schools**.
  - IARC Summer School 2016, *International Arctic Research Center, University of Fairbanks*: $2,500 + accommodation
  - ACDC Summer School 2015, *Norwegian Research School in Climate Dynamics*: Travel, accommodation, meals
  - New Directions Short Course IMA 2015, *Institute for Mathematics and its Applications, University of Minnesota*: Travel, accommodation, meals
  - PCMI Summer School 2013, *Institute for Advanced Study, Princeton*: Travel, accommodation, meals

2009/10  **Scholarship for Study Abroad Program at the University of Toronto**, *University of Bonn*, Travel and tuition fees.

2008 - 2012  **German Academic Scholarship Foundation Award**, *Studienstiftung des deutschen Volkes*, for outstanding academic achievements (given to 0.5% of German university students).

2006  **Ferry Porsche Award**, *Porsche AG*, for excellent performance in mathematics and physics.

2006  **Award German Physical Society**, *German Physical Society*, for excellent performance in physics.

2006  **Award Reinhold Beitlich Foundation**, *Reinhold Beitlich Foundation*, for exceptional results in the Abitur (equiv. high-school diploma).

## Publications

2019  Y. Fujii, E. Rémy, H. Zuo, P. Oke, G. Halliwell, F. Gasparin, M. Benkiran, **N. Loose**, J. Cummings, J. Xie, Y. Xue, S. Masuda, G.C. Smith, M. Balmaseda, C. Germineaud, D.J. Lea, G. Larnicol, L. Bertino, A. Bonaduce, P. Brasseur, C. Donlon, P. Heimbach, Y. Kim, V. Kourafalou, P-Y. Le Traon, M. Martin, S. Paturi, B. Tranchant and N. Usui. Observing System Evaluation Based on Ocean Data Assimilation and Prediction Systems: On-Going Challenges and a Future Vision for Designing and Supporting Ocean Observational Networks, *Front. Mar. Sci. 6:417*. doi: 10.3389/fmars.2019.00417.

| 2019 | **N. Loose**. Adjoint Modeling and Observing System Design in the Subpolar North Atlantic, *Ph.D. Dissertation*, University of Bergen. |
| submitted | **N. Loose**, P. Heimbach and H. Pillar. Quantifying Dynamical Proxy Potential through Oceanic Teleconnections in the North Atlantic. |
| in prep. | **N. Loose** and P. Heimbach. Physics-driven Design of Observing Systems via Uncertainty Quantification in Ocean State Estimation. |
| in prep. | **N. Loose**, P. Heimbach, H. Pillar and K.H. Nisancioglu. The Dynamical Proxy Potential of the OSNAP Array. |
| in prep. | **N. Loose**, K.H. Nisancioglu and P. Heimbach. Ocean Heat Supply to Greenland's Margins: Sensitivity to far field ocean changes. |
| in prep. | **N. Loose**, H. Pillar, M. Årthun, K.H. Nisancioglu and P. Heimbach. Remote Drivers of Nordic Seas Heat Content Anomalies and Climate Predictability. |

## Presentations

### Invited Talks

| 02/2020 | **Ocean Sciences Meeting 2020**, *San Diego, USA*, N. Loose, P. Heimbach, H. Pillar and K.H. Nisancioglu: The Dynamical Proxy Potential of the OSNAP Array. |
| 04/2018 | **EGU General Assembly 2018 (solicited)**, *Vienna, Austria*, N. Loose, P. Heimbach, K.H. Nisancioglu: How informative are SST proxy data in paleoceanographic inverse modeling? - Insights from comprehensive uncertainty quantification. |
| 03/2018 | **University of Edinburgh**, *Edinburgh, UK*, N. Loose, P. Heimbach, K.H. Nisancioglu: Uncertainty Quantification and Constraints on Subsurface Heat Content at Greenland's Margins. |
| 03/2018 | **Northumbria University**, *Newcastle, UK*, N. Loose, P. Heimbach, K.H. Nisancioglu: Uncertainty Quantification and Constraints on Subsurface Heat Content at Greenland's Margins. |

### Conference Presentations

| 10/2018 | **ECCO Meeting**, *Austin, USA*, N. Loose and P. Heimbach: Comprehensive Observing System Design within the ECCO Framework. |
| 07/2018 | **Workshop on Sensitivity Analysis and Data Assimilation in Meteorology and Oceanography**, *Aveiro, Portugal*, N. Loose and P. Heimbach: Uncertainty Quantification as a Tool for Observing System Design - An Oceanographic Perspective. |
| 06/2018 | **TACOMA Workshop**, *Oxford, UK*, N. Loose and P. Heimbach: Adjoints as a Tool for Observing System Design. |
| 03/2018 | **CHESS Meeting**, *Sommarøy, Norway*, N. Loose, P. Heimbach and K.H. Nisancioglu: Uncertainty Quantification and Observational Constraints in Paleoceanographic Inverse Modeling. |

### Posters

| 06/2017 | **Data Assimilation Workshop**, *Bergen, Norway*, N. Loose, P. Heimbach, K.H. Nisancioglu: How Informative are Paleoceanographic Observations for an Inverse Problem?. |
| 05/2017 | **PAGES Workshop**, *Louvain-la-Neuve, Belgium*, N. Loose, P. Heimbach and K.H. Nisancioglu: How Informative are Paleoceanographic Observations for an Inverse Problem?. |
| 04/2017 | **EGU General Assembly 2017**, *Vienna, Austria*, N. Loose, P. Heimbach and K.H. Nisancioglu: Uncertainty Quantification for Non-Linear Inverse Problems with Sparse Data. |

03/2017 **Workshop on Emerging Applications of Data Assimilation in the Geosciences**, *Leiden, Netherlands*, N. Loose, P. Heimbach and K.H. Nisancioglu: Uncertainty Quantification for Adjoint-Based Data Assimilation with Sparse Data.

12/2016 **AGU Fall Meeting 2016**, *San Francisco, USA*, N. Loose, P. Heimbach and K.H. Nisancioglu: Can Paleo Ocean Proxy Data Constrain General Circulation Models Using an Inverse Method?.

## Field Work

07/2017 - **East Greenland Ice-Core Project (EastGRIP)**, *Greenland*.
08/2017 ○ Drilled shallow ice cores, conducted surface measurements and lab work in the science trench

08/2016 - **G.O. Sars**, *Irminger Sea*.
09/2016 ○ Collected physical oceanographic data and marine sediment cores for the Ice2Ice project (ERC)

## Skills

Programming

○ Python, MATLAB, MITgcm, Fortran, C++, Unix/Linux operating systems, shell scripting, NetCDF, LaTeX.

Languages

○ *Fluent in:* German, English, Norwegian; *Basic knowledge in:* Spanish, Italian.